

**REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 1-8, 18, 19, 25, 29-31, 33-36, and 43 and 45 are pending in the application subsequent to entry of this Amendment.

Claim 44 is cancelled without prejudice.

In the interest of expediting prosecution, Claim 1 is amended so as more clearly to define the invention.

No new matter has been added to the application by way of these amendments.

The examiner's claim rejections are overcome or they are traversed as set forth below.

Referring now to the numbered sections of the Office Action:

1) Examiner's intended future objection is rendered moot because Claim 44 is cancelled without prejudice.

2-3) The Examiner rejects claims 1-8, 44 and 45 under 35 USC §103 (a) as being unpatentable over Brine et al (EP0650333) in view of Wilson (US 6,401,258) and the admitted prior art. It is submitted that the obviousness rejection based on the combination of Brine and Wilson is unjustified and wholly unrealistic.

**Re: Claim 1**

**Wilson is non-analogous art**

Wilson is clearly, without question, non-analogous art that would not have been consulted by one skilled in the art at the time of the invention. Only art that is analogous to a claimed invention may be employed in an obviousness determination. Examiner is referred to Applicant's previous arguments in our August 24th, 2009 Reply in this respect.

Since the Examiner has apparently not found Applicant's arguments to date to be persuasive, Applicant is filing herewith a statutory declaration from one of the inventors, Andrew Foreman, in which he has confirmed that the Examiner's arguments concerning Wilson are unrealistic and that the skilled person designing a polymer composite sandwich structure helmet "simply would not have considered the teachings of Wilson because it is describing novelty hats, also known as "cheese hats".

### **Amendment of Claim 1**

Claim 1 now specifies:-

and consolidating the layers such that the three layers ~~act as one material~~ are bonded together to form a substantially rigid polymer composite sandwich structure.

Explicit basis for the above amendment may be found in the present specification in the paragraph bridging pages 15 and 16 (esp. page 16, line 4 and page 15, line 20).

Those features were already inherent in claim 1: all polymer composite sandwich (PCS) structures are substantially rigid and claim 1 already mentioned a PCS structure in the preamble. However, despite the Applicant filing an extract from Wikipedia in the August 24th, 2009 Reply explaining such structures, the Examiner appears to have failed to give this aspect due patentable weight.

The present invention is concerned with a process for assembling a polymer composite sandwich structure into a safety helmet. Sandwich core technology is discussed from page 5 onwards of the specification. Sandwich structured composites are special classes of composites (i.e. engineered materials) in which two thin but stiff skins surround a lightweight core material to provide an integral structure with a high level of overall stiffness. (See, for example, the previously filed extract with a definition from the online free encyclopedia, Wikipedia, found at: [http://en.wikipedia.org/wiki/Sandwich\\_structured\\_composite](http://en.wikipedia.org/wiki/Sandwich_structured_composite).) As now specified in claim 1, the polymer material permeates the three layers and hardens so that the three layers are bonded together to form a substantially rigid polymer composite sandwich structure.

As discussed immediately below, Wilson's teaching is incompatible with the PCS technology of Brine and would never have been combined therewith.

**Wilson cannot be combined with Brine because it teaches away from Brine**

**i) Wilson merely teaches adhering or securing components together**

Brine and the present invention are both concerned with composite sandwich structures where two outer skins and a core layer are bonded together (usually with heat and pressure) to form a single, substantially rigid composite structure (e.g. like an aircraft wing). After hardening,

it acts and feels like a single component and has entirely different characteristics to the components from which it is formed.

By contrast, as Examiner concedes, Wilson is merely teaching “the concept of joining together preshaped elements” with adhesive (see page 8, second paragraph of the December 9, 2009 Office Action). Those elements are merely adhered or stuck together by the method of Wilson. They remain separate components and retain their separate respective properties. They remain soft, flexible and squashy! See Wilson Column 1, line 66: “a fabric layer can be adhered over the elastomeric foam”; or Column 2, line 1: “in the case of the foamed in place process the components can be adhered together while being supported within a supportive mold structure”.

This is a **hugely significant technical difference** and means that, in reality, the skilled person would instantly have dismissed the teachings of Wilson as being incompatible with that of Brine. The Examiner’s attempts to try to draw parallels - or common technical teachings - between the respective teachings of the acknowledged prior art/Brine/Wilson and the present invention are strained and contrived and have glossed over this important difference. It is much easier to join components with adhesive at their interface than it is to ensure a resin matrix has fully infused a number of layers, and that these have been consolidated to form a single fused integral rigid component.

**ii) Brine, in common with the PCS art, is concerned with the lay-up by hand of 2D layers or plies prior to consolidation to form a single composite structure whereas Wilson is only concerned with joining together 3D shaped components**

The Examiner does not appear to have appreciated that the two outer skins of a polymer sandwich composite are usually made by laboriously laying up 2D sheets or plies of reinforcing fabric, usually at right-angles to each other (for maximum strength), usually by hand, combining with the 2D sheet of resilient material, and infusing and hardening with resin to form the hardened composite. Thus, a 3-D article is made from 2-D sheet materials. Brine merely follows that same methodology but using a sheet of resilient material to form the inner core layer. It was a hugely innovative step for the present Inventors to realize that the inner core layer could be pre-shaped as a 3D shape.

The second paragraph of page 7 of the present specification makes it clear that: “The first and third polymer reinforced fibre layers are shaped and formed during the method of the present invention”, as defined in present claim 1.

It is submitted that the skilled person would instantly have dismissed Wilson because that document is not concerned with building up a structure from 2D layers. Rather, it is concerned with joining or adhering one 3D component (a pre-shaped fabric shell 12) to a pre-shaped or in-situ shaped 3D foam shell. It is submitted that the technical issues and problems between the former and the latter are so different that the skilled person would instantly have dismissed the teachings of Wilson as incompatible and unhelpful for PCS technology.

**Existing Technical Prejudice**

Indeed, given the above established practice of “laying-up” layers or plies, the skilled person would have been technically prejudiced against any other methods, and indeed, would have already had to have overcome this prejudice and arrived at the inventive concept in even thinking to select Wilson.

**Wilson has been impermissibly cited with hindsight**

Applicant further submits that this rejection is improper because it is based upon a document selected solely with hindsight. This reference is not in the PCS field. Nor is it in the field of safety helmets. This reference has merely been found by a keyword search using terms such as “helmet”, “foam”, “composite”, when in fact it has nothing to do with the provision of a true “safety helmet” or a true “composite”. One has to question how, absent hindsight, the Examiner came to rely upon a reference that relates to “headgear for sports fans”, and is clearly in a non-analogous art area.

**Re: Claims 2-8**

Claims 2 to 8 are allowable by virtue of their appendence to allowable claim 1; *see* MPEP §2143.03. However, it is also noted that claims 3 and 5 are each clearly patentable in their own right over Brine. Claim 3 requires the first layer to be bonded to the second layer prior to introduction into the mold. Claim 5 requires the third layer to be bonded to the second layer prior to introduction to the mold. Claim 1 requires the second layer to already be substantially shaped as required. It therefore acts as a template for the first and third layers making lay-up much easier.

By contrast, according to Brine, it would be necessary to squash and fold the second layer during insertion to try to get it into the desired shape. It would make assembly even more difficult, if not impossible, if one were to attempt to stick multiple layers together before insertion in the mold. Brine is teaching the layer by layer lay-up of 2-D layers. It is only the concept of the present invention of using an intermediate shaped core as a template that it is then possible to contemplate the luxury of sticking the outer layers to the shaped core layer before insertion. Hence claims 3 and 5 are also inventive in their own right, when read in combination with claim 1.

**Re: Claims 44-45**

Claim 44 is cancelled.

The above arguments in respect of claim 1 apply equally to claim 45.

4) Examiner alleges that claims 18, 19, 25 and 43 are rejected under 35 USC §103 (a) as being unpatentable over Brine et al (EP0650333) as applied to claim 1 above, and further in view of Bothwell et al. (GB1,173,275) and Foreman et al. (Design, Manufacture, and Test of Lightweight Composite Sandwich Helmets).

Claims 18, 19, 25 and 43 are allowable by virtue of their appendance to allowable claim 1.

5) Examiner alleges that claims 29-31 are rejected under 35 USC § 103 (a) as being unpatentable over Brine et al (EP0650333) and Wilson (US 6,401,258) as applied to claim 1 above, and further in view of Wallace (US 4,972,527).

Claims 29-31 are allowable by virtue of their appendance to allowable claim 1.

Moreover, concerning claims 29-31, Applicant's previous responses noted how claim 29 is directed towards protecting an important and novel and inventive subsidiary technical aspect, namely, the use of at least three interconnecting sections to form the second layer. This allows the present invention, namely the idea of using a pre-formed i.e. pre-shaped foam sandwich core, to be applied to both non re-entrant and re-entrant shaped helmets.

As explained in Applicant's previous responses in connection with the non-obviousness of claim 1, at the time of the invention, it was highly innovative to depart from standard sandwich core structures – involving the mere laying up, by manual assembly, of a plurality of 2D (two-dimensional) material layers (as taught by Brine) prior to resin infusion/curing – to

think to use a pre-shaped core layer which could act as a template – so that after curing one arrives at one integrated component. In the same vein, the present invention goes further in this subsidiary aspect, by considering that a pre-shaped part could be made up of at least three **interconnecting** sections. Interlinking of 3D shaped sections within the middle layer prior to resin infusion is also highly innovative and hence, claims 29 to 31 each introduce additional features that are highly patentable in their own right.

6) Examiner alleges that claims 33-36 are rejected under 35 USC § 103 (a) as being unpatentable over Brine (EP0650333) as applied to claim 1 above, and further in view of Wagner (DE3837189A1).

Claims 33 to 36 are allowable by virtue of their appendance to allowable claim 1.


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For the above reasons it is respectfully submitted that all pending claims are novel and inventive and therefore in condition for allowance. Favorable reconsideration is requested.

Respectfully submitted,

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